

Use of Pesticides in Hawaii

Chlordane and other similar pesticides (e.g., heptachlor and heptachlor epoxide) are chemicals that were legally used to protect homes and businesses from termites throughout the United States from the late 1940s to 1988 when their use was banned by the EPA because of concerns about damage to the environment and harm to human health. Because Hawaii's climate is very conducive to ground termite infestation, local pest control companies, homeowners, the city and county, and the state and military regularly used chlordane until 1988. The most common treatment method was to apply chlordane, and related pesticides, into the soil beneath and around building foundations. Because chlordane was the most commonly used pesticide to control termites in Hawaii, the City and County of Honolulu have stated that these pesticides can be found "universally" throughout the island. Even though it has been nearly 26 years since the use of chlordane was banned, these pesticides tend to break down slowly in the environment, so residual amounts may be present near housing and businesses throughout the United States, both on and off military installations, including MCBH.

Background Information on the Pa Honua III Housing Area

Pa Honua III is located at MCBH on the Mokapu peninsula, adjacent to Kaneohe Bay, O'ahu. Pa Honua III, comprises the Pa Honua III Family Housing Area (previously known as FY-63 North and FY-64 neighborhoods). The Family Housing Area is approximately 39 acres and consists of 212 duplex-style housing units that were constructed in 2006. Ohana Military Communities, LLC is the lessee of this property and owns and operates all 212 units.

During construction of the Pa Honua III Family Housing units in 2005, soil tests confirmed the presence of chlordane at concentrations that exceeded the 2002 EPA PRG of 1.6 ppm. In the process of preparing the property for new housing development, pesticide impacted soil resurfaced due to demolition of the original houses and foundations and grading of the soil. At the request of NAVFACPAC in 2005, the Navy Environmental Health Center conducted a comprehensive health risk assessment for the pesticides found in soil.

Summary of the Risk Assessment for the Pa Honua III Family Housing Area

The Pa Honua III Family Housing Area risk assessment was a comprehensive study of the health risks associated with potential exposure to pesticides detected in soil. The purpose of the study was to determine if chlordane (and other pesticides) that were detected at concentrations exceeding the EPA's PRG: (1) could be left in place, (2) could be reused on the property by placing it under impervious surfaces that would prevent human contact, and/or (3) should be excavated and disposed of at an appropriate landfill/treatment facility.

Sources of Data

At the time the risk assessment was completed, the

THE RISK ASSESSMENT FOR PA HONUA III FOLLOWED METHODOLOGY DEVELOPED BY THE US NAVY AND THE EPA

The risk assessment for Pa Honua III was developed following EPA Guidance and was comprised of the following steps:

- Data Evaluation and Reduction
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization

Navy evaluated all of the soil data available from the Pa Honua III Family Housing Area using a comprehensive approach. Soil samples were purposely collected in areas that were expected to have the highest concentrations of chlordane (i.e., near the location of the former building foundations where chlordane was applied to control termites). As part of typical construction activities, soil was scraped and stockpiled on the site to be used as fill after the new duplexes were constructed. This stockpiled soil and the subsurface soil around foundations were the focus of this human health risk assessment. The construction site was divided into six areas for the purposes of grouping and evaluating the soil samples.

Exposure Assessment

A detailed, site-specific, conceptual site model was developed to determine how people might potentially be exposed to pesticides in soil at the site. The exposure scenarios based on current and

Marine Corps Base Hawaii: MILCON Housing Pa Honua III 2005 Health Risk Assessment Fact Sheet



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Marine Corps Base Hawaii (MCBH) is committed to ensuring our families are safe while their service members are serving our country at home or overseas. The purpose of this fact sheet is to provide Navy & Marine Corps families with an overview of the 2005 Human Health Risk Assessment conducted for the Pa Honua III Housing Area (also known as the MCBH 212 Housing Area).

Executive Summary

During demolition of the existing houses and construction of the Pa Honua III Family Housing Area in 2005/2006, chlordane (a pesticide) was detected in soil at concentrations that exceeded the 2002 Environmental Protection Agency (EPA) Preliminary Remediation Goal (PRG) of 1.6 ppm. The chlordane used on this property was legally applied around and under the foundations of the original houses in order to prevent termite infestation. At the request of Naval Facilities Engineering Command Pacific

(NAVFAC PAC) in 2005, the Navy Environmental Health Center (now named Navy & Marine Corps

Public Health Center [NMCPHC]) conducted a comprehensive health risk assessment for the pesticides found in soil. The risk assessment concluded that although some chlordane concentrations were higher than the EPA's PRG they were still considered acceptable per EPA Guidelines. This was true for all locations; however, there was one subsurface location (i.e., subsurface soil sample #2-11) that had higher concentrations than the rest of Pa Honua III.



For an extra margin of safety, the soil at that location was removed and placed under a concrete basketball court so it could not be disturbed and thus eliminated risks to Pa Honua III's residents, their guests, and workers. Before these measures were implemented, the Navy provided a site visit, briefings, and documents to the Hawaii Department of Health (HDOH).

Note: In 2007, Ohana Military Communities performed an independent environmental investigation of soil at Pa Honua III after all construction activities had been completed. The report concluded that the low concentrations of pesticides that were detected in soil samples were considered acceptable based on HDOH criteria. These results were consistent with the results of the human health risk assessment performed by NEHC in 2005. Consequently, no additional cleanup actions were recommended at the Pa Honua III property based on Ohana Military Communities' 2007 study.

IMPORTANT NOTE REGARDING EPA'S PRGs

Soil tests higher than 1.6 parts per million of chlordane do not require removal of the soil. The 1.6 ppm figure is not an EPA action level. Instead, it is a conservative "screening level," used to establish the point at which further site-specific analysis is required to determine if remediation or mitigation measures are required. The Navy/Marine Corps performed this analysis and the results are presented in NEHC's Human Health Risk Assessment which is the focus of this fact sheet.

future land use evaluated in the risk assessment included:

- **Resident** – Adults and children who live at the site 350 days per year for six years. Residents could potentially be exposed for a maximum of six years. This was based on two three-year tours, which is the Navy's /Marine Corp's maximum tour-length at one location.
- **Construction Worker** – A construction worker who works at the site 250 days per year (i.e., five days per week for three years (i.e., until construction of the duplexes was completed).
- **Maintenance Worker** – A maintenance worker/gardener who works at the site 50 days per year (i.e., one day per week with 2 vacation days) for 25 years.
- **Utility Worker** – A utility worker who works at the site 14 days per year for 25 years.

Each of the receptors were evaluated for exposure to chlordane, heptachlor, and heptachlor epoxide via:

- Incidental Soil Ingestion
- Dermal Contact with Soil
- Inhalation of Soil Particulates

WHY DIDN'T THE RISK ASSESSMENT INCLUDE RISKS TO RESIDENTS BASED ON A 30-YEAR EXPOSURE?

The risks for a resident exposed for 30-years were included in the risk assessment. However, the risk assessment focused on an exposure duration of six years (i.e., two three-year assignments) rather than 30 years as generally recommended by the EPA for evaluating residential exposures because the Marine Corp's/Navy's maximum tour length at a location is six years. The risks for the 30-year residential exposure was included for comparison purposes. This approach is consistent with the EPA Region IX Guidance that is used to develop the Preliminary Remediation Goals (PRGs) used by the State of Hawaii:

"The PRGs contained in the Region 9 PRG Table are generic; they are calculated without site specific information. However, they may be re-calculated using site specific data."

All of the exposure parameters used to calculate exposure were identical to those used to calculate EPA's 2002 PRGs except for those noted above.

EPA RISK MANAGEMENT CRITERIA IDENTIFYING ACCEPTABLE VERSUS UNACCEPTABLE RISKS

The results of the HHRA were presented in terms of cancer risks and noncancer hazards for the six stockpiles of topsoil and five areas. These risks were calculated using all of the soil sampling results from each stockpile or area. NEHC evaluated these rates for safety using the following EPA risk management criteria:

- An increased cancer risk of 1×10^{-6} (1 new case of cancer in a million people exposed) or less is considered acceptable.
- An increased risk greater than 1×10^{-4} (1 new case of cancer in 10,000 people exposed) is considered unacceptable and requires action to reduce the risk.
- Risks between 1×10^{-6} and 1×10^{-4} are generally considered acceptable, but they do need site-specific evaluation to determine if they are safe or if any action is needed to reduce risks.
- A noncancer hazard less than or equal to one is considered acceptable.
- A noncancer hazard greater than one may be unacceptable and generally requires a chemical-specific evaluation to determine if any action is needed to reduce the risks.

What Was Learned?

Chlordane, heptachlor and heptachlor epoxide were found in soil at the Pa Honua III Family Housing Area. These pesticides were legally applied in the past to the housing foundations on the site to prevent termite infestation. Soil with measurable amounts of chlordane, heptachlor and heptachlor epoxide resurfaced during demolition and grading of the previous housing area in preparation for development of new housing. Potential health risks from exposure to these pesticides were estimated for residents, construction workers, maintenance workers, and utility workers. The conclusions and recommendations presented in the risks assessment are summarized below:

1. The majority of the cancer risks were well within the EPA's acceptable risk range (i.e., a cancer risk less than 1×10^{-4} and a noncancer hazard less than or equal to 1), but there were a few risks that fell in the acceptable range that required further evaluation. After reviewing the planned use of the site and all of the results,

NEHC considered the six stockpiles of topsoil and five areas acceptable. However, NEHC recommended follow-up action(s) at soil sample location #2-11 (see item 2).

2. Subsurface sample #2-11 in Area 2 had a chlordane result of 104 mg/kg which was the highest result observed in soil samples collected from Pa Honua III but still fell within EPA's acceptable risk range. However, as an extra measure of safety, NEHC recommended that the soil at this location either be removed and/or covered with an impermeable surface to prevent exposure and eliminate any health risks.

What Was Done?

The subsurface soil at sample location #2-11 was removed and placed under a concrete basketball court so it could not be disturbed and thus eliminated risks to Pa Honua III's residents, their guests, and workers. Before these measures were implemented, the Navy provided a site visit, briefings, and documents to the Hawaii Department of Health.

Results of an Independent Environmental Study Conducted in 2007 on the Pa Honua III Housing Area

In 2007, Ohana Military Communities performed an independent environmental investigation of soil at Pa Honua III after all construction activities had been completed. Soil sample locations (both surface soil and subsurface soil [approx. 1.5 feet

below ground surface]) were collected throughout Pa Honua III. Two samples were collected from each of the 106 buildings which were grouped by location into a total of 10 decision units.

The report concluded that: No pesticides exceeded their respective Tier 2 Environmental Action Levels in any samples at any of the decision units.

These results were consistent with the results of the human health risk assessment performed by NEHC in 2005. Consequently, no additional actions were recommended at the Pa Honua III property based on these results.

Note: Soil sampling results are compared with Tier 1 or 2 EALs, consistent with Hawaii Department of Health Guidance. HDOH concludes that the COPCs do not pose a significant threat to human health or the environment when concentrations are less than EALs. Tier 1 EALs are developed by HDOH and are based on generic, default assumptions. Tier 2 EALs are based on Tier 1 EALs but include modifications based on site-specific information (e.g., how long a person may be exposed at a site). Both Tier 1 and Tier 2 EALs are considered protective of human health by HDOH.

FOR MORE INFORMATION

If you have any questions or concerns, please contact:

Hana Like (Section 802 Housing)

Phone: (808) 257-1282

Email: mcbh.g4.fmy.hsg.fmb@usmc.mil

Forest City

Please contact Forest City through their website at <http://yourmcbhousing.com/contact/>

More information on soil management for other Ohana Military Communities can be found at: Forest City:

- <http://yourmcbhousing.com/>

More information on pesticides can be found at: Hawaii Department of Health:

- <http://eha-web.doh.hawaii.gov/eha-cma/Downloads/HEER/termicidefactsheetfinalsept2011.pdf>

Centers for Disease Control and Prevention (CDC) National Biomonitoring Program – Chlordane and Heptachlor Fact Sheets:

- http://www.cdc.gov/biomonitoring/ChlordaneHeptachlor_FactSheet.html
- http://www.cdc.gov/biomonitoring/ChlordaneHeptachlor_BiomonitoringSummary.html

Agency for Toxic Substances & Disease Registry (ATSDR) Chlordane Fact Sheet:

- <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=354&tid=62>

Environmental Protection Agency (EPA):

- Chlordane Hazard Summary Fact Sheet: <http://www.epa.gov/ttn/atw/hlthef/chlordan.html>
- EPA Preliminary Remediation Goals (PRGs): (<http://www.epa.gov/Region9/waste/sfund/prg/index.html>)